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Douglas-Fir Tussock Moth

Boyd E. Wickman,[1] Galen C. Trostle[2] and Paul E. Buffam[3]

The Douglas-fir tussock moth (*Hemerocampa pseudotsugata* McDunnough) is an important defoliator of true firs and Douglas-fir in western North America. Severe tussock moth outbreaks have occurred in British Columbia, Idaho, Washington, Oregon, Nevada, California, Arizona, and New Mexico, but the area subject to attack by the moth is more extensive (fig. 1).

Outbreaks of the Douglas-fir tussock moth appear to develop almost explosively, and after a year or two, they usually subside abruptly. However, some outbreaks have persisted at low level for as long as 8 years. During a severe outbreak, caterpillars are found crawling over rocks, trees, brush, ground, and animals, but once an outbreak subsides, it is usually difficult to find even one caterpillar.

Defoliation by the tussock moth greatly retards tree growth, kills and top-kills many trees, and so weakens many others that they are top- or all-killed by other insects. In one outbreak in California, for example, 20 percent of the merchantable white fir in heavily defoliated stands died. This loss amounted to 11,071 board feet per acre. An additional 1,113 board feet per acre was lost through reduction in the radial growth of partly defoliated trees; 12 percent of these trees were top-killed. Outbreaks of the moth have caused serious damage in Washington and Idaho (fig. 2). In these and other Western States, infestations have killed as much as 75 percent of the firs on small acreages.

Hosts

This moth has four preferred hosts, and its preference appears to depend on locality. In the central area of its range (Washington, Oregon, and Idaho), Douglas-fir, subalpine fir, white fir, and grand fir are all equally acceptable. In the south (California, Arizona, and New Mexico), white fir is the preferred host. However, in any locality, after the caterpillars have eaten the preferred foliage, they feed on many other trees and shrubs. Larvae have been found feeding on ponderosa pine, Jeffrey pine, sugar pine, western hemlock, and western larch after the preferred hosts have been stripped. Only lodgepole pine and incense-cedar have been left untouched.

Evidence of Infestation

Usually the first indication of attack appears in late spring. The newly hatched larvae feed on new foliage, causing it to shrivel and turn brown. These larvae are inconspicuous, but by mid-July they

[1]Research entomologist, Pacific Northwest Forest and Range Experiment Station, USDA Forest Service.
[2]Forest entomologist, Intermountain Region, USDA Forest Service.
[3]Forest entomologist, Southwestern Region, USDA Forest Service.

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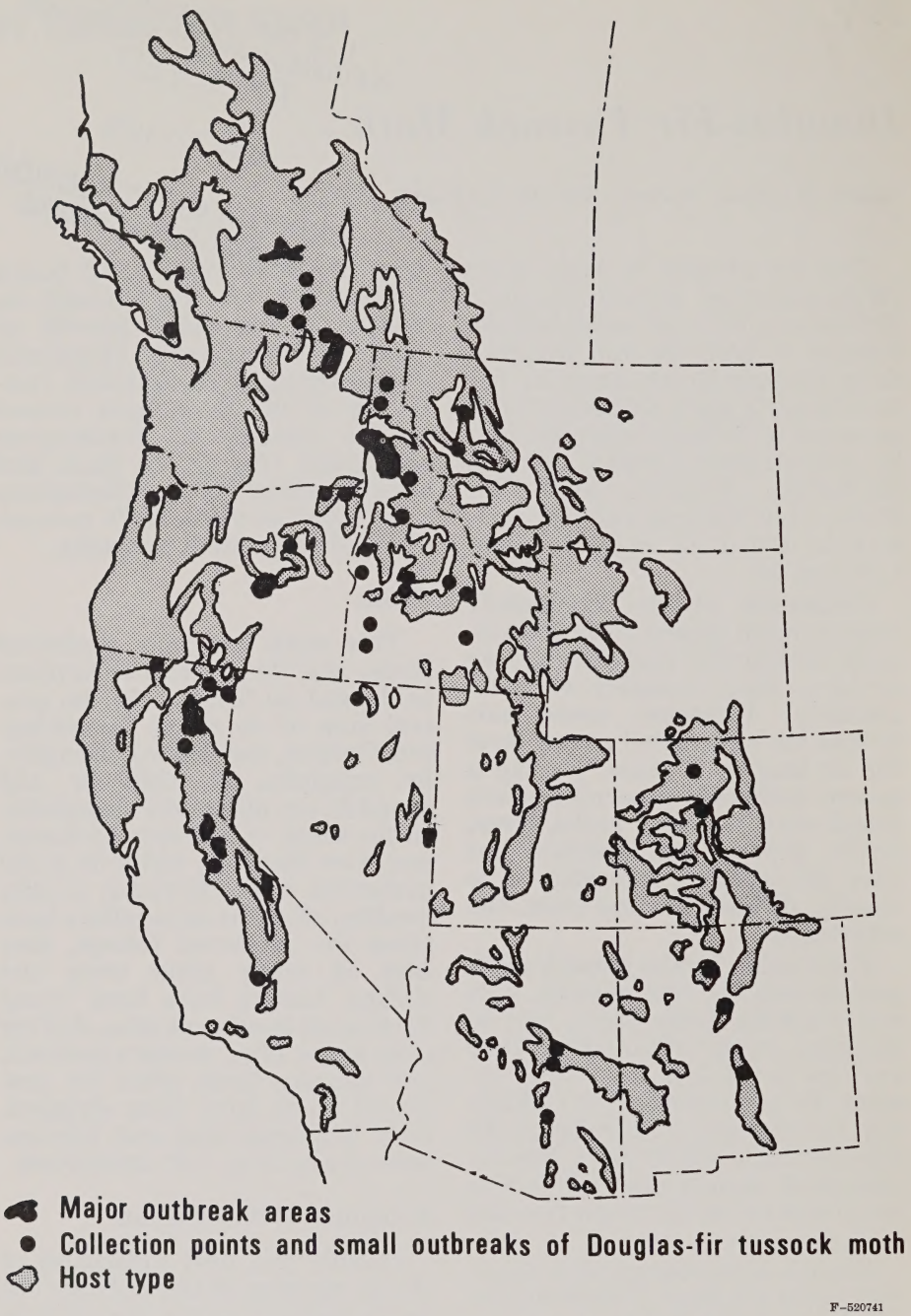

Figure 1.—Areas of Douglas-fir tussock moth outbreaks, places where the moth has been collected, and range of host trees.

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Figure 2.—Douglas-fir stand killed by the Douglas-fir tussock moth in the 1945–47 outbreak near Moscow, Idaho.

are larger, more colorful, and easily visible. At that time they feed on both old and new foliage. They first strip needles from the tops of trees and the outermost portions of the branches; then they feed lower in the crown and farther back on the branches.

By August, as the larvae reach pupation, the crowns of most of the firs may be completely bare. At this time a tussock moth outbreak is confirmed by the large numbers of colorful caterpillars dropping from defoliated trees and crawling almost everywhere. The loose webbing produced by the caterpillars as they travel from branch to branch forms netting that catches and holds pieces of needles dropped as the larvae feed. The brown tips, bare twigs, and dried needle pieces caught in the webbing give the trees a brown, dead appearance.

Description

The adult male (fig. 3, *A*) is an ordinary grayish moth with feathery antennae and a wingspread of 1 to 1¼ inches. The forewings are gray and have two indistinct, irregular dark bars and two vague whitish spots. The hindwings are a contrasting brown. The female (fig. 3, *B*) is very different in appearance, having tiny rudimentary wings, small, threadlike antennae, and a large abdomen. She is usually about ¾-inch long and is grayish; her abdomen is conspicuously darker at the tip because of a dense coat of exceptionally long, dark hairs.

Mature larvae are up to 1¼ inches long and are very colorful. Two long, dark tufts or pencils of hair similar to horns are located just back of the head; a similar but longer pencil is on the posterior end. Four dense, buff-colored

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Figure 3.—Douglas-fir tussock moth: *A*, Adult male; *B*, adult female; *C*, female after laying eggs on cocoon; *D*, full-grown larva.

tussocks are located forward along the middle of the back (fig. 3, *D*). The rest of the body, except the legs and head, is covered with short hairs radiating from red, buttonlike centers.

A sex-connected color variation is notable: the female has a black skin with almost-white hairs, and the male has a lighter colored skin with yellowish or buff hairs. These body hairs irritate the skin of some persons; loggers and farmers working in the woods during an outbreak often develop an itching rash from contact with airborne caterpillar hairs.

Life History and Habits

The tussock moth produces one generation each year. Adults appear from late July to early September, depending on season and location.

When the female emerges from her pupal cocoon, mating takes place immediately. She clings tenaciously to the outside of her cocoon and lays her eggs on its surface (fig. 3, *C*). In light infestations, cocoons with their attached egg masses usually are scattered on the foliated twigs on the upper part of tree crowns; in heavy infestations they are on the lower parts of trees. Where defoliation is severe, cocoons may be bunched on the trunk, on the lower side of larger limbs, or on objects some distance from the tree.

Each female lays her eggs in a single mass (about ½ inch in diameter) of a dry, frothy, gelatinous substance that contains many hairs from her body. She may lay from a few to as many as 350 nearly spherical, white eggs in one to three layers in this mass. She then dies, leaving the eggs to over-

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Figure 4.—Hatching tussock moth larvae on egg mass.

winter in the gray, woolly mass attached to the cocoon.

Late in May, after host trees have begun their new growth, the tiny 1/8-inch, gray, hairy caterpillars begin to hatch (fig. 4). Their long hair and light weight allow them to be carried by wind.

Since the female moth does not fly, major dispersal of populations is by windborne larvae. The larvae grow slowly at first, but during their five to seven moults, they grow progressively faster and eat proportionately more.

Pupation occurs any time from late July to the end of August inside a thin cocoon of silken webbing mixed with larval hairs. The pupal stage lasts from 10 to 18 days, depending on temperature; then the moth emerges to begin the life cycle again.

Natural Control

The Douglas-fir tussock moth has many natural enemies, including disease organisms, insect parasites and predators, and birds. Probably most important is a nucleopolyhedrosis virus disease that is capable of wiping out high populations, but it usually appears only after trees have been seriously defoliated. When diseased larvae die, their internal organs liquefy and their bodies fall to the ground or lie smeared over the foliage. These diseases commonly kills both larvae and pupae.

One important insect enemy of the tussock moth is an egg parasite, the *Telenomus* wasp. Flies and other wasps kill the larvae. Parasitism by *Telenomus* may almost completely destroy individual egg masses and may destroy as much as half the eggs in an infested area. One species of fly, *Pseudosarcophagae affinis* (Fall.), parasitized two-thirds of the cocoons during an outbreak in eastern Washington forests in 1955.

Chemical Control

As this publication goes to press, no chemical agents are recommended. Check with your county agricultural agent, State agricultural experiment station, or local forester to learn whether recommendations have been developed.

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